REMARKS

I. Claim Changes

Claim 2 has been amended so that it is now the main independent claim. Claim 1 has been canceled. Claim 2 was not rejected based on two of the four prior art references, namely US '666 and US '647.

II. Claim Objections

The claims were objected to because of the term "*aluminum-free* borosilicate glass". This term is intended to mean that the borosilicate glass is free of aluminum in any form.

First, there is explicit basis for this terminology on page 5, line 1, of the applicants' originally filed specification. Second, the "Objects of Invention" in the last paragraph on page 4 of the specification was amended to include this term. Also the "Objects of Invention" section states that the glass is free of Al_2O_3. Third, the last paragraph on page 2 of the background section states that "aluminum" (not necessarily aluminum oxide) in the form of ions in the glass would be harmful to persons in some applications if it were included in the glass.

Furthermore the manner in which glass compositions are claimed as a collection of oxide ingredients with a concentration range for each ingredient is a

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formal device that does not necessarily mean that the glass batch only contains the oxide ingredients. For example, Baak, et al, in claims 8 and 9 claim a glass containing 1 to 6 mole percent BaO. However the description of the glass batch in Table I on page 5 shows that they actually added $BaCO_3$. Of course, the CO_2 is driven off during the high temperature batch processing conditions, but that would not be the case for all barium salts. The same is true for all aluminum salts.

The foregoing observations underscore the fact that glass compositions are not defined in claims by reciting the actual ingredients in the initial batch and their amounts. Instead the corresponding metal oxides are recited with amount ranges that are obtained by converting the amount of the actual metal compound used in the initial glass batch to the equivalent amount of the oxide added using basic chemical principles. The statement that the glass is aluminum-free is intended to mean that there are no aluminum compounds in the borosilicate glass.

On the other hand, if it would help advance the prosecution of the claims, applicants would probably be willing to include an additional statement in claim 2 to the effect that the glass is free of Al_2O_3, based on page 6, line 19, of the originally filed specification.

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III. Obviousness Rejection based on US '776

Claims 1 to 14 were rejected under 35 U.S.C. 103 (a) as obvious over US Patent 3,499,776, issued to Baak, et al.

Claim 1 has been canceled, obviating its rejection. Claim 2 has been amended so that it is an independent claim. The scope of claim 2 is narrower than the canceled claim 1 and it is respectfully submitted that the concentration ranges of the components of the glass composition of claim 2 do not overlap those of US '776.

Page 3 of the Office Action states that applicants' claims recite a glass composition comprising ingredients with concentration ranges that overlap those of the prior art. However the concentration ranges for the ingredients in US '776 are in Mol %, while the concentration ranges of applicants' claimed glasses are in % by weight. Thus it is not readily apparent from the cited reference, US '776, that their concentration ranges overlap the concentration ranges of applicants' claim 1.

It is respectfully submitted that unless the concentration ranges of US '776 (Abstract or column 3) can be readily converted by comparatively simple manipulations to concentration ranges in % by weight that US '776 cannot establish a case of *prima facie* obviousness based on overlapping concentration ranges.

The table provided on page 3 of the Office Action is appreciated.

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Applicants' representative understands that it allegedly shows two exemplary glass compositions in which the composition is reported in both % by weight and Mol %. However the source of this table is not mentioned in the Office Action. Also the manner in which the numerical values are obtained is not mentioned. Furthermore the table in the Office Action is not present in US '776 so that one skilled in the art who reads US '776 would not be aware of the results shown in the table.

In addition, because of the narrower ranges of claim 2 examples A and B of the Table on page 3 of the Office Action no longer fall within the concentration ranges of claim 2. The % by weight of SiO_2 of example A is too large and greater than the upper limit of 75 wt. % in claim 2. The % by weight of ZrO_2 of example B is too large and greater than the upper limit of 11 wt. % of ZrO_2 in claim 2.

Also none of the examples in Tables I to IV of US '776 anticipate the glass compositions of applicants' claim 1 based on conversion calculations made by the applicants. For example, when example 7 of Table II (column 6) is converted to weight percent, the SiO_2 wt. % is well above the upper limit for the SiO_2 concentration in amended claims 2 and 3. However the concentration of Na_2O is about 4.4 % by weight, which is above the 3 % in the amended claims 2 and 3.

In fact, most of examples 5 to 55 of US '776 are not relevant because they include substantial amounts of Al_2O_3. In contrast, the claimed glass compositions of applicants' claims 2 to 14 are free of aluminum in any form, especially Al_2O_3. In addition the claimed compositions of applicants' claims 2 to 14 avoid anticipation by any of the glass compositions of tables II, III and V of US '776 because e.g.

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claim 2 requires at least 5 % by weight of K_2O.

Each remaining example no. 36 to 41 and 47 to 52 of Table IV, which comprise K_2O but not Al_2O_3, do not satisfy one or more other composition limitations of claim 2. Applicants have converted the concentration values in Mol-% in Table IV to %-by-weight values for examples 36 to 41 and 47 to 52. Most of the converted K_2O values of these examples are well below the 3 % by weight required by applicants' claim 1. Furthermore for the relevant examples the B_2O_3 concentrations are well below the lower limit for B_2O_3 in applicants' claim 1.

Furthermore the glass compositions of Baak, et al, may include up to 4 Mol % Al_2O_3 according to their claims 1 and 4. Many of the examples in the Tables of US '776 include substantial amounts of Al_2O_3.

Thus US '776 contains teaching against the applicants' claimed invention, which requires the glass compositions to be free of aluminum in any form, especially Al_2O_3. It is well established that a prior art reference that contains teaching against or the opposite from a claimed invention cannot be used under 35 U.S.C. 103 (a) to reject a claimed invention as obvious. See MPEP 2145 X. Especially the Federal Circuit Court of Appeals has said:

> "In determining whether such a suggestion [of obviousness] can fairly be gleaned from the prior art...It is indeed pertinent that these references teach against the present invention. Evidence that supports, rather than negates, patentability must be fairly considered." ***In re Dow Chemical Co.,*** 837 F.2nd 469,473, 5 U.S.P.Q.2d 1529, 1532 (Fed. Cir. 1988)

US '776 teaches glass compositions which may contain aluminum, while

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the claimed invention requires exclusion of aluminum, especially in the form of Al_2O_3, from the glass compositions.

Also the claimed glass composition of the applicants have unexpectedly lower working points in general than the working points of Baak, et al. See the working points on the four graphs of figures 1 to 4 of Baak, et al, and compare them with the working point range of claim 14 above.

Thus for the foregoing reasons it is respectfully submitted that US '776 does not suggest applicants' glass compositions or establish a case of *prima facie* obviousness of applicants' glass compositions.

For the foregoing reasons withdrawal of the rejection of amended claims 2 to 14 under 35 U.S.C. 103 (a) over US Patent 3,499,776 is respectfully requested.

IV. Obviousness Rejection based on US '161

Claims 1 to 14 were rejected under 35 U.S.C. 103 (a) as obvious over US Patent 4,562,161, issued to Mennemann, et al.

Claim 1 has been canceled, obviating its rejection. Claim 2 has been amended so that it is an independent claim. The scope of claim 2 is narrower than the canceled claim 1.

Although the concentration ranges of claim 2 do overlap the very broad concentration ranges of the abstract and column 2 of US '161, it is respectfully submitted that the concentration ranges of the reference are **too broad** to be

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considered to correspond to the concentration ranges of applicants' claim 2 **with sufficient specificity to establish a case of *prima facie* obviousness**. For example, compare the range for F, which is 0 to 0.6 in applicants' claim 2, to the range of 0 to 5 for F in the abstract of US '161. In the case of TiO_2 applicants' range of 0 to 1 in claim 2 barely touches the range of 1 to 15 for TiO_2 in the range of the reference and is an order of magnitude (factor of 10) smaller. K_2O is a required ingredient in the case of applicants' claim 2 with a range of 5 to 10, while K_2O is optional in the case of the reference with a range of 0 to 10 (twice as broad).

In general, the very broad generic disclose of a glass composition in the abstract and column 2 of the reference is too broad and does not correspond to applicants' concentration ranges **with sufficient specificity** to establish *prima facie* obviousness.

Furthermore the concentration ranges for one or more components of the glass compositions claimed **in the claims of US '161** do **not** overlap corresponding ranges for those components in applicants' claim 2. In the case of independent claims 1, 2, 11 and 12 of US '161 the B_2O_3 concentration range does not overlap the corresponding range for B_2O_3 in applicants' claim 2. In the case of independent claims 3, 4 and 5 of US '161 the lower limit for the TiO_2 concentration is well above the upper limit for TiO_2 in applicants' claim 2.

Furthermore the glass compositions of US '161 may include up to 10 % by weight of Al_2O_3 according to the broad disclosure in the abstract. Many of the examples in the Tables of US '161 include substantial amounts of Al_2O_3.

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Thus US '161 contains teaching against the applicants' claimed invention, which requires the glass compositions to be free of aluminum in any form, especially Al_2O_3. It is well established that a prior art reference that contains teaching against or the opposite from a claimed invention cannot be used under 35 U.S.C. 103 (a) to reject a claimed invention as obvious. See MPEP 2145 X. Especially the Federal Circuit Court of Appeals has said:

> "In determining whether such a suggestion [of obviousness] can fairly be gleaned from the prior art...It is indeed pertinent that these references teach against the present invention. Evidence that supports, rather than negates, patentability must be fairly considered." ***In re Dow Chemical Co.,*** 837 F.2nd 469,473, 5 U.S.P.Q.2d 1529, 1532 (Fed. Cir. 1988)

US '161 teaches glass compositions which may contain aluminum, while the claimed invention requires exclusion of aluminum, especially in the form of Al_2O_3, from the glass compositions.

As a result of the compositional differences with Mennemann's glass compositions the applicants' claimed glass compositions have exceptionally good working points.

For the foregoing reasons withdrawal of the rejection of amended claims 2 to 14 under 35 U.S.C. 103 (a) over US Patent 4,562,161, issued to Mennemann, et al, is respectfully requested.

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V. Obviousness Rejections based on US '666 and US '647

Claims 1 and 9 to 14 were rejected under 35 U.S.C. 103 (a) as obvious over Smalley, et al, U.S. Patent 3,574,666.

Claims 1 and 9 to 14 were rejected under 35 U.S.C. 103 (a) as obvious over Yamashita, et al, U.S. Patent 3,998,647.

Claim 1 has been canceled, obviating its rejection on these grounds. Claim 2 was not rejected on these grounds.

Furthermore the concentration range for F of claim 2, namely 0 – 0.6 fails to overlap the concentration range in column 2, line 10, of Smalley, et al. The same is true of the SiO_2 concentration range and the M_2O sum range.

Also according to Smalley, et al, alumina can be an optional ingredient but it is excluded from applicants' glass compositions.

In the case of Yamashia, et al, the upper limit for SiO_2 is well below its lower limit according to applicants' amended claim 2.

Furthermore dependent claims 3 to 14 have been amended to depend on claim 2 and to include concentration ranges that do not conflict with the narrow concentration ranges of applicants' amended claim 2. In other words, the dependent claims were amended so that none of their concentration ranges for their ingredients were broader than the corresponding concentration range of amended independent claim 2.

For the foregoing reasons withdrawal of the rejections of amended claims

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9 to 14 as obvious under 35 U.S.C. 103 (a) over Smalley, et al, U. S. Patent 3,574,666 and also over Yamashita, et al, U. S. Patent 3,998,647 is respectfully requested.

Should the Examiner require or consider it advisable that the specification, claims and/or drawing be further amended or corrected in formal respects to put this case in condition for final allowance, then it is requested that such amendments or corrections be carried out by Examiner's Amendment and the case passed to issue. Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing the case to allowance, he or she is invited to telephone the undersigned at 1-631-549 4700.

In view of the foregoing, favorable allowance is respectfully solicited.

Respectfully submitted,

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